EARLY CAREER RESEARCHER SYMPOSIUM 2017

ECRS

BROOKHAVEN NATIONAL LABORATORY

November 2, 2017

# PROGRAM

# LETTER FROM THE ORGANIZERS

Dear Guest,

Welcome and thank you for participating in the sixth annual Early Career Researcher Symposium (ECRS), presented by the Association of Students and Postdocs (ASAP).

This symposium is a showcase of the exceptional research that is performed by students and postdocs at Brookhaven National Laboratory (BNL). Today the BNL early career researcher community will present their recent work through 32 oral presentations and 26 posters. A career panel and two distinguished lectures will complement this display of work.

In the morning, we will hear from Dr. Rudolf Tromp from the IBM T.J. Watson Research Center. In the afternoon, Barbara Hoffheins, Technical Advisor in the U.S. Department of Energy, Nuclear National Security Administration, will address the symposium. The career panel will feature numerous professionals across a wide range of scientific backgrounds where students and postdocs will have the opportunity learn from their experience. Laboratory Director Doon Gibbs will deliver the award ceremony and closing remarks, which will be followed by a networking reception.

The symposium was organized by a group of students and postdocs whose work and generous donation of time show great dedication to their fellow researchers. Financial support was provided by the sponsors listed on the back cover of this program. We encourage you to visit their booths throughout the day and explore the links provided on the ECRS website (https://www.bnl.gov/ecrs2017/sponsors.php). ASAP is an organization dedicated to ensuring a high quality of life for early career researchers at BNL. It is funded by Brookhaven Science Associates and supported by senior staff members. The ASAP board recognizes the importance of professional development to its members and it is in this spirit that we present the ECRS. Thank you for your participation and support for the ECRS. We hope that you enjoy your day.

Sincerely,

The ASAP Board

Matthew Musgrave

Jonathan Gentile

Mengen Wang

Amber Teufel

Arbin Timilsina

Shruti Sharma

# PROGRAM SCHEDULE

| | | |
|---|---|---|
| 8:00-8:45 | **Registration**<br>**Poster Hanging**<br>**Breakfast** | Lobby |
| 8:45-9:00 | **Opening Remarks**<br>Robert Tribble | Auditorium |
| 9:00-10:30 | **Parallel Oral Sessions** | A, B, C, Auditorium |
| 10:30-11:30 | **Career Panel**<br>Dr. Katheen Flint Ehm<br>Dr. James Hainfeld<br>Dr. Robert Konik, Ph<br>Dr. Timothy O'Connor<br>Dr. Aleida Perez | Auditorium |
| 11:30-12:15 | **Morning Keynote Address**<br>Dr. Rudolf Tromp | Auditorium |
| 12:15-2:00 | **Poster Session**<br>**Exposition**<br>**Lunch (on your own)** | Lobby |
| 2:00-3:20 | **Parallel Oral Sessions** | A, B, C, Auditorium |
| 3:20-3:45 | **Coffee Break** | Lobby |
| 3:45-4:30 | **Afternoon Keynote Address**<br>Barbara Hoffheins | Auditorium |
| 4:30-5:00 | **Closing Remarks**<br>Doon Gibbs<br>**Awards Presentation** | Auditorium |
| 5:00-7:00 | **Reception** | Lobby |

# PARALLEL ORAL SESSIONS: MORNING

| | Room A<br>Session Chair: Mengen Wang | Room B<br>Session Chair: Arbin Timilsina | Room C<br>Session Chair: Hande Ozturk | Auditorium<br>Session Chair: Dave Shaffer |
|---|---|---|---|---|
| 9:00-9:20 | A Generalizable Protocol for Producing High Aspect Ratio $ABO_3$ Oxides and Demonstration of Oxygen Evolution Activity of $LaNiO_3$<br>*Coray Mcbean*<br>Condensed Matter Physics and Materials Science | Probing nucleon structure from Lattice QCD simulations<br>*Christos Kallidonis*<br>Physics | Ultra-high-speed Serial Micro Crystallography at NSLS-II<br>*Yuan Gao*<br>Photon Sciences | Hydrogenation of $CO_2$ on ZnO/Cu(111) Catalyst: Role of Metal-Oxide Interface in Methanol Synthesis<br>*Robert Palomino*<br>Chemistry |
| 9:20-9:40 | *In-situ* Tracking Chemical Transportation within Single Particle During Synthesis of Concentration-Gradient Cathodes<br>*Ming Zhang*<br>Sustainable Energy Technologies Department | Probing the proton spin structure using a new detector at STAR<br>*David Kapukchyan*<br>Physics | Operando Multi-modal Synchrotron Investigation for Structural and Chemical Evolution of Metal Sulfide Additives in Li-S battery<br>*Cheng-Hung Lin*<br>Photon Sciences | Atomic layered Au clusters confined over $\alpha$-MoC for catalyzing the low temperature water gas shift reaction<br>*Siyu Yao*<br>Chemistry |
| 9:40-10:00 | Assessing Burn Effects on Short-term Ecosystem Dynamics in the Brookhaven Pine Barrens Forest using Lidar and Hyperspectral Data<br>*Feng Zhao*<br>Environmental and Climate Sciences | Measurement of transverse single spin asymmetries for $\pi^0$ at forward rapidities at $\sqrt{s}$ =500 GeV polarized proton collisions at STAR<br>*Zhanwen Zhu*<br>Physics | Tomography Study on 3D Morphology of Nano-Silver Powder Sintering for Semiconductor Processing<br>*Yu-Chung Lin*<br>Photon Sciences | First Principles Study of Lithium Ion Batteries: Spinel Electrode Material<br>*Haoyue Guo*<br>Chemistry |
| 10:00-10:20 | Measuring post-fire canopy recovery across a burn severity gradient in a mixed pine-oak forest using airborne imaging spectroscopy and LiDAR<br>*Ran Meng*<br>Environmental and Climate Sciences | Measurement of the unpolarized inclusive jet cross section for proton-proton collisions at the STAR detector<br>*Dmitry Kalinkin*<br>Physics | Three-Dimensional Morphological and Chemical Evolution of Nanoporous Stainless Steel by Liquid Metal Dealloying<br>*Chonghang Zhao*<br>Photon Sciences | Single Anionic Redox Chemistry of Layered Sodium Chromium Sulfide<br>*Zulipiya Shadike*<br>Chemistry |

# PARALLEL ORAL SESSIONS: AFTERNOON

| | Room A<br>Session Chair: Shruti Sharma | Room B<br>Session Chair: Yaguang Zhu | Room C<br>Session Chair: Hande Ozturk | Auditorium<br>Session Chair: Yichao Tian |
|---|---|---|---|---|
| 2:00-2:20 | **First Principles Study of the Covalently Self-Contained Aluminosilicate Bilayer**<br>*Mengen Wang*<br>Center for Functional Nanomaterials | **A statistical approach to Higgs couplings in the SMEFT**<br>*Christopher Murphy*<br>Physics | **Healing X-ray scattering images**<br>*Jiliang Liu*<br>Center for Functional Nanomaterials | **$^{72}$As a Candidate for PET Imaging: From Production to *In Vivo* Imaging**<br>*Vanessa Sanders*<br>Collider Accelerator |
| 2:20-2:40 | **Unravelling Photocarrier Dynamics Beyond the Space Charge Region for Photoelectrochemical Water Splitting**<br>*Wenrui Zhang*<br>Center for Functional Nanomaterials | **Building Prototypes of ATLAS's Inner Tracker for High Luminosity LHC**<br>*Prajita Bhattarai*<br>Physics | **Development of monolithic MEMS-based multilayer Laue lens nanofocusing optics for hard x-ray microscopy**<br>*Wei Xu*<br>National Synchrotron Light Source II | **Synthesis and X-ray characterization of Bi-alkali antimonide photocathodes**<br>*Mengjia Gaowei*<br>Instrumentation Division |
| 2:40-3:00 | **Photon Counting Performance of Amorphous Selenium and Its Dependence on Detector Structure**<br>*Jann Stavro*<br>Center for Functional Nanomaterials | **Brookhaven builds a new ATLAS inner detector for High Luminosity-LHC: Testing the first prototypes**<br>*Laura Bergsten*<br>Physics | **Implication of ferroelectricity during the growth of ferroelectric superlattices and heterostructures**<br>*Rui Liu*<br>National Synchrotron Light Source II | **Proton Irradiation Studies to Diamond Detectors**<br>*Mengnan Zou*<br>Instrumentation Division |
| 3:00-3:20 | **Quantum Dot-$MoS_2$ Hybrids: Comparison of Interfacial Charge Transfer and Energy Transfer Towards Optoelectronic Applications**<br>*Mingxing Li*<br>Center for Functional Nanomaterials | **Local modulation of carrier density in graphene-ferroelectric field effect transistors through flexoelectric switching**<br>*Anna Gura*<br>Physics | **Mechanistic Study of Zirconium Based Nano-anti-corrosion Surface Pretreatment**<br>*Xiaoyang Liu*<br>National Synchrotron Light Source II | **Development of a gamma-ray detector for nonproliferation and national security**<br>*Luis Ocampo Giraldo*<br>Nonproliferation and National Security Department |

# MORNING KEYNOTE SPEAKER

## Dr. Rudolf Tromp

Rudolf Tromp is a Dutch/American scientist who received a degree in Physics Engineering from Twente University in 1976, and a PhD in Physics and Mathematics from Utrecht University in 1982. He joined the IBM T.J. Watson Research Center in Yorktown Heights, NY , as a Research Staff Member in 1983. Since that time he has held several management positions, and served on the Corporate Technical Strategy team. In 2006 he also joined the staff at Leiden University as Professor of Surfaces and Materials. Over his career, Tromp has published about 250 refereed papers in international journals, as well as 35 US and international patents.

His interests include the physics and chemistry of surfaces and interfaces, as well as advanced analytical methods to study the nanoscale properties of such surfaces and interfaces. For example, he invented Surfactant Mediated Epitaxial growth, studied thermodynamics and kinetics of nucleation, imaged atomic structure and electronic states of silicon surfaces, explored new directions in lithography, and developed new theoretical and experimental methods in Medium Energy Ion Scattering, Scanning Tunneling Microscopy, Transmission Electron Microscopy, and Low Energy Electron Microscopy.

Tromp is a Fellow of the American Physical Society, American Vacuum Society, Materials Research Society, and the Böhmische Physical Society. He has received several awards for his work, including the MRS Medal, the APS Davisson-Germer Prize, and the AVS Medard W. Welch Award. Most recently, he received the APS Distinguished Lectureship on the Applications of Physics. His talk at the Brookhaven National Labs Early Career Researcher Symposium will be given under the auspices of this Distinguished Lectureship program.

# AFTERNOON KEYNOTE SPEAKER

## Barbara Hoffheins

Ms. Hoffheins is currently serving as a Technical Advisor in the U.S. Department of Energy, Nuclear National Security Administration in Washington, D.C. She has worked for Brookhaven National Laboratory in the Nuclear Nonproliferation and National Security Division since 2002. As a Brookhaven staff member, she has spent almost twelve years on international assignments related to nuclear nonproliferation and verification in Austria and Japan. She was the Liaison Officer for Brookhaven's International Safeguards Project Office (ISPO) at the U.S. Mission to International Organizations in Vienna, Austria, where she served as the interface between the U.S. Support Program for technical support to the International Atomic Energy Agency's Safeguards Division from 2005 to 2009 and from 2013 to 2017. She was an Invited Engineer at the Japan Atomic Energy Agency's Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (current name) in Tokai-mura, Japan from 2010 to 2013.

Ms. Hoffheins worked as a development engineer and then a group leader at Oak Ridge National Laboratory from 1983 to 2002, and as an electrical apprentice and then journeyman electrician at the Y-12 Plant from 1978 to 1980.

Ms. Hoffheins holds an M.S. Electrical Engineering from the University of Tennessee and a B.S. Electrical Engineering from Tennessee Technological University. She also has a U.S. Department of Labor certificate as a Journeyman Electrician.

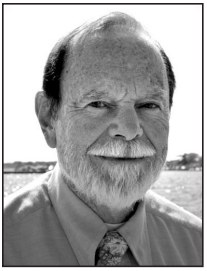
Ms. Hoffheins' technical publications fall into two subject categories, sensors and international safeguards. She holds three patents and was awarded two R&D100 Awards for sensor developments. In 2016, she was a recipient of the Brookhaven Award for her work in ISPO. She is a longstanding member of the Institute for Nuclear Materials Management.

# CAREER PANEL SPEAKERS

**Dr. Kathleen Flint Ehm**

Kathleen Flint Ehm, Ph.D., is Director for Graduate and Postdoctoral Professional Development in the Graduate School at Stony Brook University. Dr. Flint Ehm has over a decade's experience in postdoctoral policy and professional development for PhDs, including issues related to responsible conduct of research training, program and policy development, and fostering the advancement of postdoc women in academic science. Previously she served as the founding director of Stony Brook's Office for the Integration of Research, Education, and Professional Development (IREP), focused on fostering initiatives at the intersection of the university's research and education missions. She spent the previous six years at the National Postdoctoral Association in Washington, DC, serving as project manager for grant-funded initiatives. In 2004, she spent a year in residence at the National Science Foundation where she was a Science and Technology Policy Fellow sponsored by the American Association for the Advancement of Science. There she specialized in issues concerning early-career scientists and helped manage one of NSF's newest postdoctoral fellowship programs. An astronomer by training, Dr. Flint Ehm was a Postdoctoral Fellow at Gemini Observatory North and a Carnegie Fellow at the Carnegie Institution of Washington's Department of Terrestrial Magnetism. She holds a Ph.D. in Astronomy and Astrophysics from the University of California, Santa Cruz, and a B.S. in Math and Astronomy from the University of Arizona.

# CAREER PANEL SPEAKERS



**Dr. James F. Hainfeld**

Dr. James F. Hainfeld is the President, founder and chief Research Scientist of Nanoprobes, a nanoparticle research collaborative dedicated to finding nanoparticle treatments for cancer and other diseases. Dr. Hainfeld also holds joint appointments as a Guest Scientist at Brookhaven National Laboratory and Adjunct Professor at Stony Brook University. He is the winner of the 2011 Röntgen Prize by the British Institute of Radiology, for special merit and contributing to the advancement of the science and practice of radiotherapy, radiobiology, and physics. Dr. Hainfeld is a senior scientist, his world bridging biology, physics and chemistry. One of the original fathers of the nanoparticle, he engineered some of the very earliest under an electron microscope at Brookhaven National Laboratory in the 1970s. After founding his own laboratory at Nanoprobes in 1990, Dr. Hainfeld has pursued his passion: seeking cures for cancer and other diseases, using specially engineered nanoparticles. Dr. Hainfeld's current research is focused on the use of gold and magnetic nanoparticles for cancer therapy, medical uses of metal nanoparticles as contrast agents for X-ray and MRI for heart disease and tumor detection, development of new labels for light and electron microscopy, ultra-sensitive detection methods, and fusion protein drug development.

Dr. Hainfeld holds a BSE in Electrical Engineering from Princeton University and a PhD in Chemistry/Biochemistry from the University of Texas at Austin, and he was a postdoctoral fellow at the University of Chicago. He joined the Biology Department at Brookhaven National Laboratory in 1976, where he worked until 2009, becoming co-principal investigator of the Scanning Transmission Electron Microscope STEM Facility. Dr. Hainfeld was nationally elected to serve as Counsellor to The Histochemical Society, and served on the Editorial Board of the Journal of Histochemistry and Cytochemistry. He has obtained over 25 patents and has more than 150 reviewed publications.

# CAREER PANEL SPEAKERS

**Dr. Robert Konik.**

Robert Konik is chair of the Condensed Matter Physics & Materials Science (CMPMS) Division at Brookhaven National Laboratory. He oversees the activities of roughly 60 scientists in the division engaged in the study of basic and applied aspects of materials, their uses, and their electronic, physical, mechanical, and chemical properties.

Robert joined Brookhaven Lab as a Research Scientist in 2003, with promotions to Assistant Physicist (2004), Associate Physicist (2006), and Physicist (2009). He served as deputy chair of CMPMS during 2015, becoming chair at the beginning of 2016. He has also been an adjunct professor at Boston College (since 2011), an associate editor at the journal Physical Review B (since 2008), is an Honorary Researcher at the London Centre for Nanotechnology (2015-2019), and has held visiting appointments at Universiteit van Amsterdam in the Netherlands and Université de Cergy-Pontoise, Paris, France.

Robert has been a member of CMPMS's condensed matter theory group since 2003. His research interests are catholic. He has authored over 70 articles in low dimensional strongly correlated electron materials, non-equilibrium physics, low dimensional field theories, integrable models, and the dynamics of planetary magnetospheres.

Robert earned his Ph.D. in theoretical high energy physics in 1998 from Cornell University. A Canadian citizen, he worked as a postdoctoral fellow funded by the Natural Sciences and Engineering Research Council of Canada in the Department of Physics at the University of California, Santa Barbara from 1997 through 1999. He then joined the University of Virginia as a Research Associate, advancing to Research Scientist in 2001.

# CAREER PANEL SPEAKERS

### Dr. Timothy P. O'Connor

Timothy O'Connor was appointed executive vice president of The Rockefeller University in February 2016. In this role, he oversees most university operations, including research support, technology transfer, facilities, and information technology, as well as finance, investments, human resources, and legal affairs. Working in partnership with the other executive officers, he provides administrative leadership to the university and represents the president both internally and externally.

Dr. O'Connor joined the university in 2013 as chief of staff and vice president, offering high-level support to the president while overseeing the university's day-to-day operations as well as its long-term initiatives, including the ongoing construction of the Stavros Niarchos Foundation-David Rockefeller River Campus.

Dr. O'Connor's career has focused on both biomedical research and academic administration. A native of Los Angeles, he majored in biology at the University of California, Berkeley; earned his Ph.D. from the University of Michigan; and worked as a postdoc in Jared Diamond's laboratory at the University of California, Los Angeles. In 1998, he set up his own lab at the City College of New York, and later moved to Weill Cornell Medical College, where he was appointed associate research professor and vice chair in the Department of Genetic Medicine.

In 2009, Dr. O'Connor moved to Yale University, where he served as associate provost for science and technology. There, he helped administer financial resources and scientific support services for researchers working in diverse areas, including biosciences, physics, chemistry, engineering, astronomy, and computer sciences, among others.

Dr. O'Connor serves on the board of several not-for-profit organizations, including the New York Structural Biology Center, the Aaron Diamond AIDS Research Center, NewYorkBIO, and the Friends of the East River Esplanade.

### Dr. Aleida Perez

Aleida Perez is a member of the Office of Educational Programs at Brookhaven National Laboratory. She oversees the High School Research Program and STEM Prep Summer Institute in addition to teaching secondary lessons at BNL. Together with scientists at National Synchrotron Light Source II, Dr. Perez mentors students and teachers how to conduct research. She earned a B.S. from the University of Puerto Rico-Cayey and a Ph.D. in Microbiology and Immunology from the University of Michigan. Prior to joining BNL, she worked as a virologist in industry and taught college-level microbiology and anatomy.

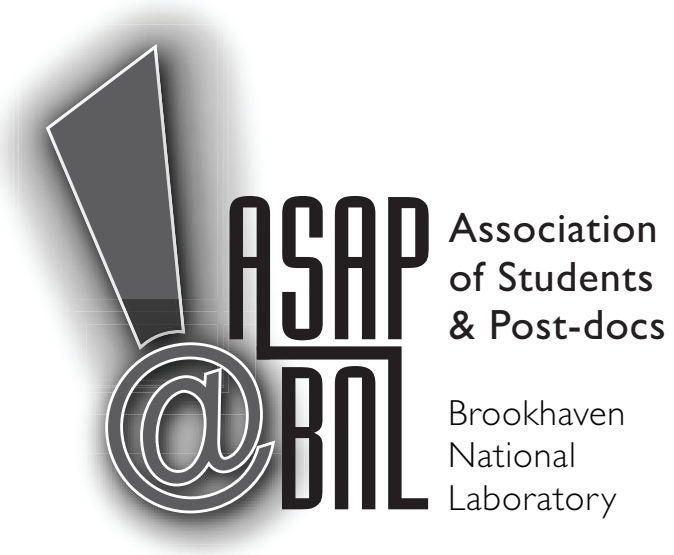
# POSTERS

1. Iron (III) Oxide: from Support to Precursor of FeRh Catalysts
   *Pamela Carrillo*
2. Surface Carboxyphilicity under Pressure: Ordering of $CO_2$ on $TiO_2$(110)
   *Rebecca Hamlyn*
3. O-O Coupling: From Detailed Mechanistic Understanding to Enhanced Water Oxidation Catalysis
   *Yan Xie*
4. *In-situ* Synchrotron Probes for Co-Doped Mesoporous $CeO_2$ Catalysts
   *Dimitriy Vovchok*
5. Experimental evidence of inverted stratification using small angle X-ray scattering
   *Amanda Carr*
6. Self-Assembly Bilayers (SABs) for Surface Anchoring via Non-Covalent Interactions
   *Lei Wang*
7. 0D-2D and 1D-2D semiconductor hybrids composed of all inorganic perovskite nanocrystals and single layer graphene with improved light harvesting
   *Jia-Shiang Chen*
8. Termination Dependence of Photocatalysis on Strontium Titanate
   *Amanda Lai*
9. Stabilization of $Cu^{2+}$ in Confined Spaces
   *Nusnin Akter*
10. Study of Reactive Ion Etching for Kinoform Lenses
    *Abdiel Quetz*
11. Correction of front end slits electromechanical issues at NSLS-II using motion controls software solutions
    *Christopher Guerrero*
12. Developing a High Pressure Flow Cell for *in situ* Investigations of the Formation of Gas Hydrates
    *Katlyn Lafranca*
13. Characterization of Synchrotron Radiation at NSLS-II
    *Alexander Lutton*
14. Design of a 12-bit, 2Msps, 1mW Successive Approximation Register Analog-to-Digital Converter for Radiation Detectors in cryogenic environments
    *Krithika Yethiraj*

# POSTERS

15. A Digital Calibration Method for 12-bit SAR ADC at 77K
    *Yuan Mei*
16. An Analog Front-end for Compton Spectrometer and Imager
    *Wenbin Hou*
17. The Separation of Actinium from Thorium using Polyoxometalates
    *Jasmine Hatcher*
18. Characterizing Cryogenic Analogue to Digital Conversion (ADC) for the Proto-DUNE Liquid Argon Time Projection Chamber
    *Carlos Pereyra*
19. Study of Laser Wakefield Acceleration Utilizing Ultrafast $CO_2$ Laser and Electron Beam
    *Pietro Iapozzuto*
20. Physical Model of Clouds and Solar Radiation, Model Evaluation, and Data Analytics
    *Mingshen Chen*
21. Nitrogen sink limitation constrains growth in two barley species
    *Angie Burnett*
22. Experimental determination of an invaded old field plant interaction network
    *Nicole Kinlock*
23. Modelling the Evolution of Secondary Organic Aerosols Through a Volatility-Based Model Approach
    *Julia Vasile*
24. Number Fraction of Black Carbon Particles from a Wood Boiler
    *Carley Fredrickson*
25. Using eDNA to detect fish species of Long Island rivers
    *Erin O'connor*
26. Entrainment rate of deep convection over the Amazon: Cloud-resolving model simulations
    *Usama Anber*

# NOTES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# THANK YOU

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Vladimir Skokov
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## GUESTS

Kathleen Flint Ehm
Rudolf Tromp
Barbara Hoffheins
James F. Hainfeld
Robert Konik
Timothy P. O'Connor
Aleida Perez

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